

**DEFENSE CONTRACT MANAGEMENT
COMMAND**



Software CAS Overview & Initiatives

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DCMDE Commander's Conference
August 1999
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Software Complexity Concerns*



A Growing Concern

- **In 1995 85% of Software Projects Finished Over Time or Budget**
- **1/2 of Projects Double Cost Estimates**
- **Projects Slip an Average of 36 Months**
- **1/3 of Projects Cancelled**

Top 400 Improving Software Engineering Practice, Patricia Sanders, Jan 1999

*Chart presented by Dr Etter, DUSD(S&T) to DoD Software Collaboration Workshop - 30 J



DCMC Can Make a Difference

Software CAS Mission

- Evaluate for adequacy and perform surveillance of contractor software development processes [FAR* 42.302(a)(41), DoD 5000.2R** (3.3.5.5, 3.3.5.6)]
- Perform surveillance to assess compliance with schedule, cost, and technical performance [FAR 42.302(a)(15, 31, 40)]
- On Site Government Assistance [DoD 5000.2R (3.3.5.5, 3.3.5.6), (3.3.6.6), FAR 42.302(a) (32,43-47,67)]

*Federal Acquisition Regulation

**Department of Defense Regulation 5000.2R, Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information System Acquisition Programs

Interrelated Functions



Software CAS Integrated Plan

Goal 1: Enhance Program Office visibility

- 1.1: Provide insight concerning contractor processes
- 1.2: Provide insight concerning contractor performance
- 1.3: Maintain cognizance of, and assist as requested in, source selection process evaluations

Goal 2: Continuous Software CAS process improvement

- 2.1: Establish a consistent and repeatable CAS approach
- 2.2: Determine necessary skills and develop training
- 2.3: Develop and refine tools and resources

Additional Information:

**April 99 DCMC Special Management
Review**



Software CAS Integrated Plan

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Goal 2: C

- 2.1:
- 2.2:
- 2.3:

evaluations

Initiative

**Capability Maturity Model
(CMM) Based Insight**

Information Memo 99-255

(9 Aug 99)



[Software] CMM - Background

- Determines maturity of contractors software development **processes**
- Developed by the Software Engineering Institute (SEI) at Carnegie Mellon University
- Accepted by Govt and Industry (de facto standard)

Optimizing: Continuous process improvement is enabled by quantitative feedback from the process and piloting innovative ideas and technologies.

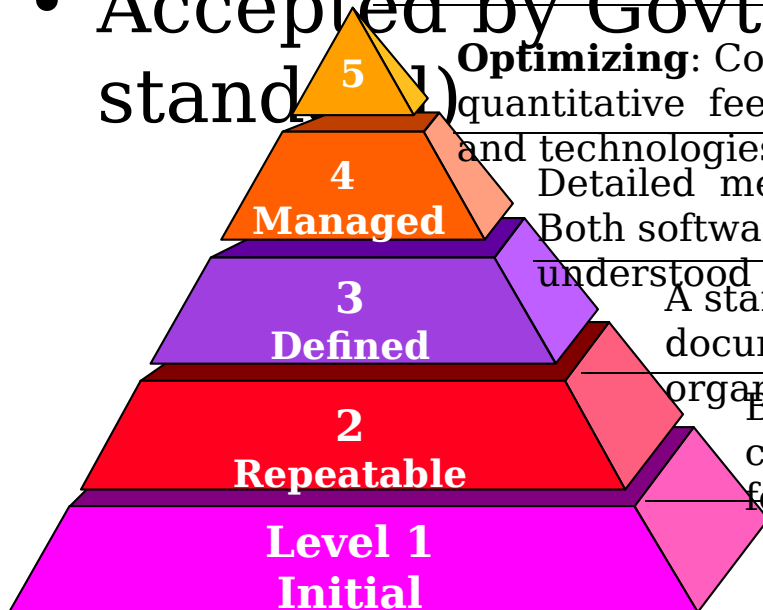
Detailed measures of process and product quality collected.

Both software process and products are quantitatively understood and controlled.

A standard organizational process established and documented. All projects use a tailored version of the organization's standard process.

Basic project management process in place to track, cost, schedule, and functionality. Repeatable results for with similar applications.

Process characterized as ad hoc.. Few processes are defined. Success based on individual effort.





Software Processes - Importance

- Today's major problems with military software development are not technical problems, but management problems

Software Engineering Institute*

- By reaching CMM level III, Lockheed Martin Tactical Aircraft Systems [over 5 year period];
 - Cut software defects 90%
 - Reduced software development costs 50%

Aviation Week & Space Technology**

*The Capability Maturity Model, Guidelines for Improving the Software Process, Carnegie Mellon University, Addison-Wesley Publishing, 1997, pg 4

** Lockheed Martin Restructures TAS Unit as 'Fighter Enterprise, July 28 1997, page 64



Software Processes -

Importance

Process linked to Performance

As maturity increases*, cost and schedule performance indices approach 100% --

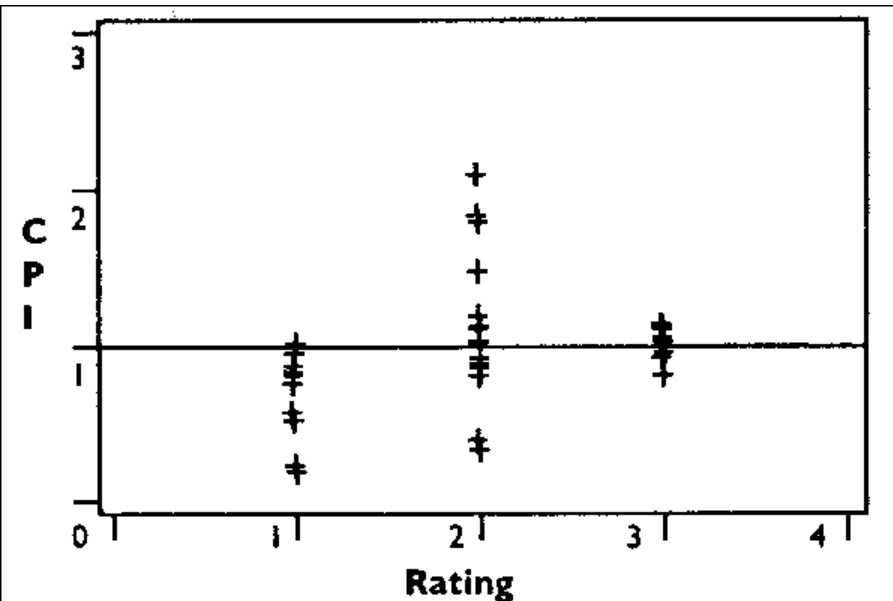


FIGURE 3: SCATTER PLOT OF CPI VS. RATING FOR HIGH AND VERY HIGH RATING RELEVANCE.

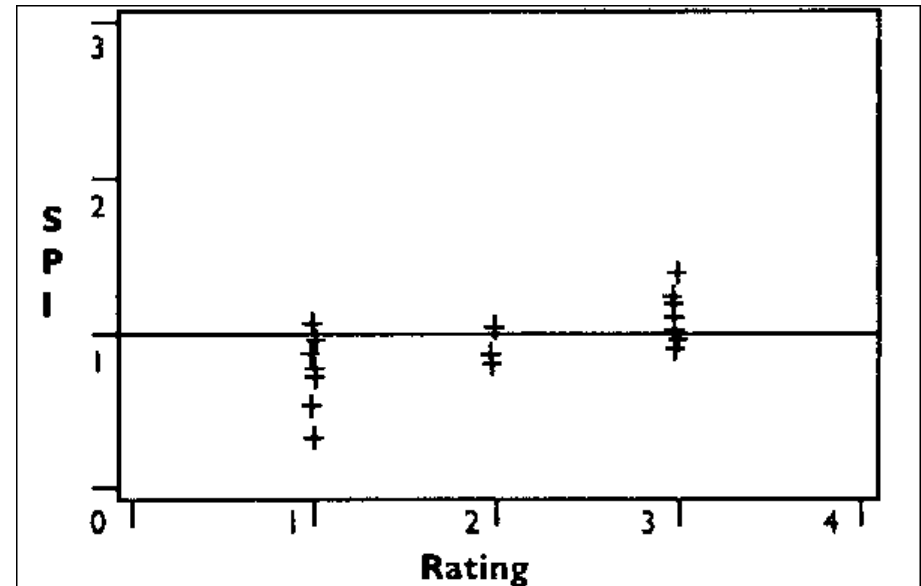
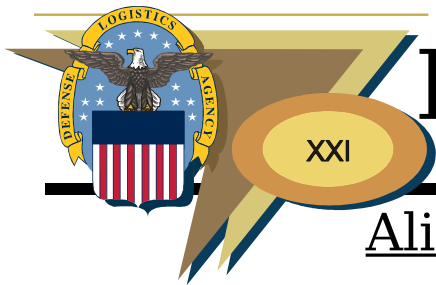


FIGURE 4: SCATTER PLOT OF SPI VS. RATING FOR LESS THAN 80 PERCENT COMPLETE.

Data from Air Force Institute of Technology Thesis, "A Correlation Study of the CMM and Software Development Performance"

(www.stsc.hill.af.mil/Crosstalk/1995/sep)

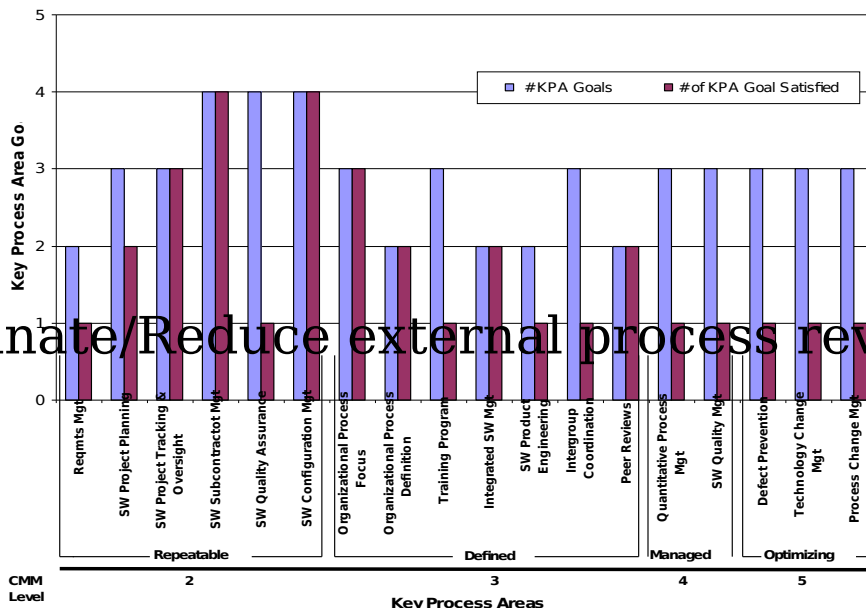
* Per Software Engineering Institute's (SEI) Software Capability



DCMC Initiative: CMM Based Insight

Aligns SW Process evaluations to the CMM

- Puts data in most useful format (Common language)
 - Basis of Capability Evaluations (Program Offices)
 - Basis of internal process reviews (Industry)
- Consistent application across DCMC



- Eliminate/Reduce external process reviews

**DCMCs CMM
Based Insight**
- Quantitative
- Consistent





Example: Common Language for

Risk Reduction DCMC Location X

- Army AMCOM concerned with poor quality software at contractor's facility - Told contractor to improve process (CMM Level III) or risk future business
- Contractor hired outside consultant to verify operations (**Believed they were CMM Level III**)
 - Consultant provided early feedback to AMCOM - Contractor appeared to be level III
 - AMCOM challenged based on observations and DCMC process data
- Evaluation results: **Contractor assessed as level I.**
- Contractor on ambitious schedule to reach level III
- DCMC monitoring progress - advising AMCOM of status



Example. Eliminate/Reduce Process Reviews

DCMC Location X

- SW CMM based surveillance in place
- Customer (Army ACAT I Program) concerned with process maturity - planned multi service software process review
- DCMC provided company and program level strengths and weaknesses
- Result:
 - DCMC data satisfied customer concerns
 - Customer did not perform the software process review
 - Savings of 6 man-days on site plus travel time/costs



Implementation

- Approach in development (Apr - Aug 99)

- Development Team:

<u>Qualification</u>	<u>Location</u>
----------------------	-----------------

- | | | |
|--------------------|------------------|--------------------|
| • David Zentner | SEI Affiliate | Software Center |
| • Gary Sigmund | SEI Affiliate | LM Delaware Valley |
| • Joe Giannuzzi | SEI Affiliate | Syracuse |
| • Richard Sierzant | SEI Affiliate | Denver |
| • Wayne Wall | Process in Use | Syracuse |
| • Lisa Ming | Process in Use | Boston |
| • Jamileh Soudah | Measurement/Tool | Software Center |

- Briefing Industry Corporate Councils - initial response favorable



Implementation

**To prove
the
concept**

**To prove
the
application**

- Validation Testing: Sep-Dec 1999
 - DCMC Syracuse
 - DCMC Boston (Nashua)
 - DCMC Denver
 - DCMC LM Delaware Valley
- Verification Testing: Mar-Jun 2000
 - Five TBD Locations; Volunteers solicited
- Training (June/July 2000)
- Command Wide (July 2000 Target)

Information Memo 99-255 (9 Aug 99)



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process evaluations

Goal 2: Continuous Software CAS process improvement

- 2.1: Es
- 2.2: De
- 2.3: De

Initiative

**DCMC Influence
Tasking Memo -xxx
(Projected Fall '99)**



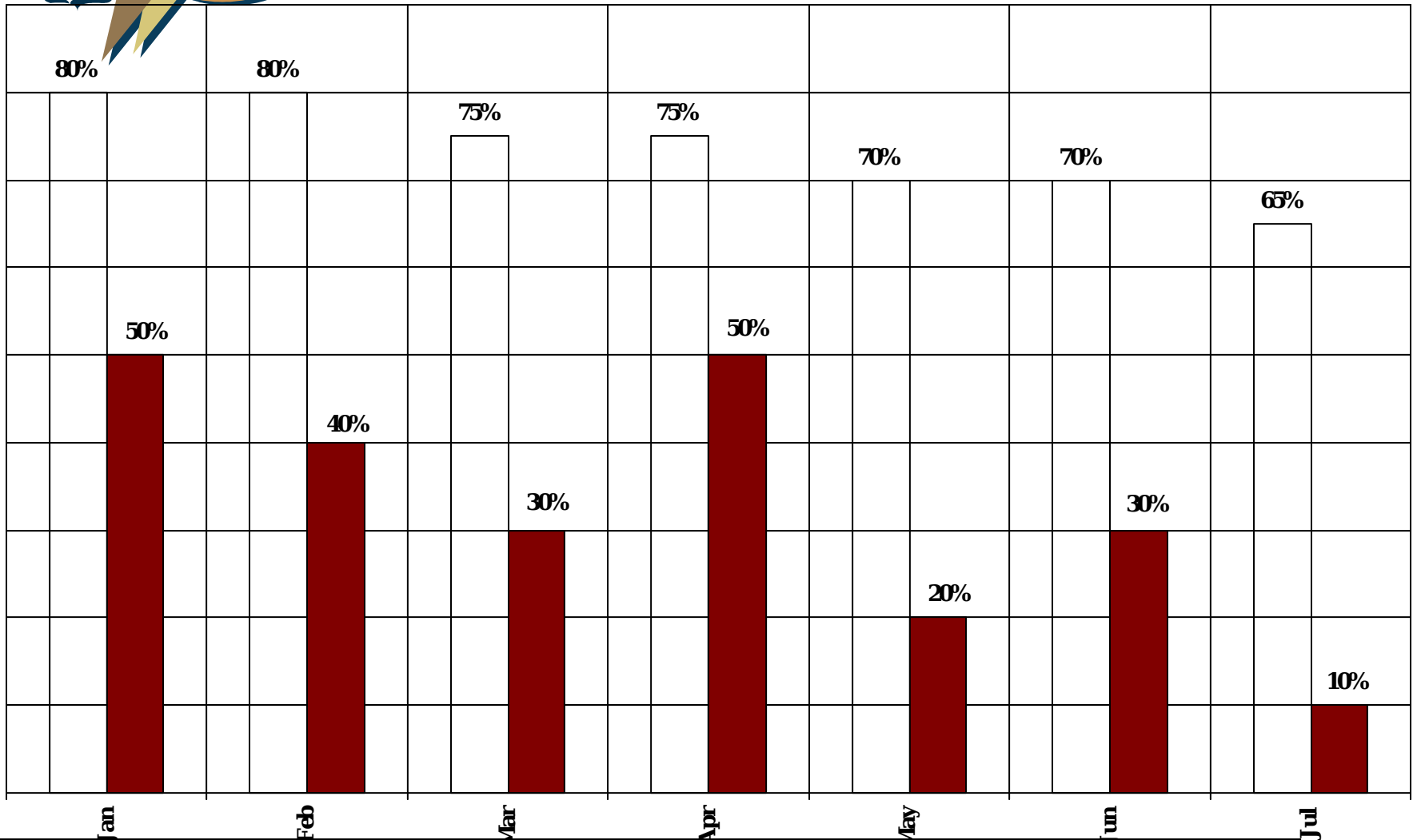
DCMC Influence

- DCMC influences software development process - How to best measure our impact?
 - Past system: Comments accepted vs comments generated
 - Problem: What does it tell you?
 - ***Proposed*** System:
 - Monitor status of high risk programs exceeding performance thresholds
 - Correlate alignment of DCMC resources and comments to determine result of our influence



Proposed Metric Software Program Status

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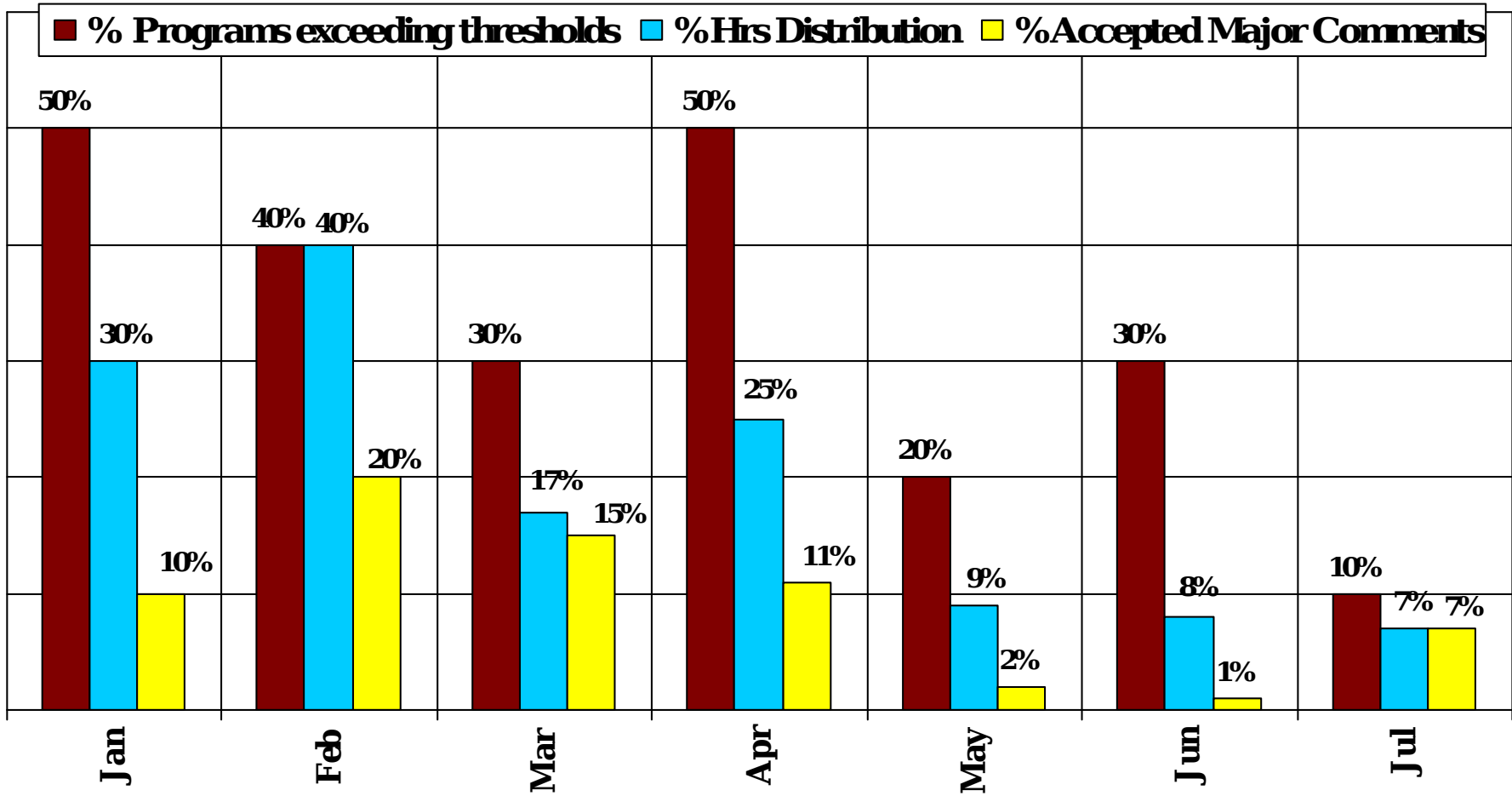


- % Moderate/High risk programs per DCMC Software Professional Estimating and Collection System
- % Programs exceeding 5% cost and schedule thresholds



Peel back: DCMC Activity on programs exceeding 5% performance thresholds

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DCMC Influence

- Metric concept in draft - Developed with field support
- Soliciting feedback from:
 - Software Program Manager's Network - 12 Aug 99
 - DCMC CAOs: 31 Aug - 2 Sep Software Symposium
- Tasking Memo: Projected Fall 99
 - Baseline data & Validation: Oct 99 - Mar 00
 - Implementation phase: Apr 00



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- 2.1: Est
- 2.2: Det
- 2.3: Dev

Initiative

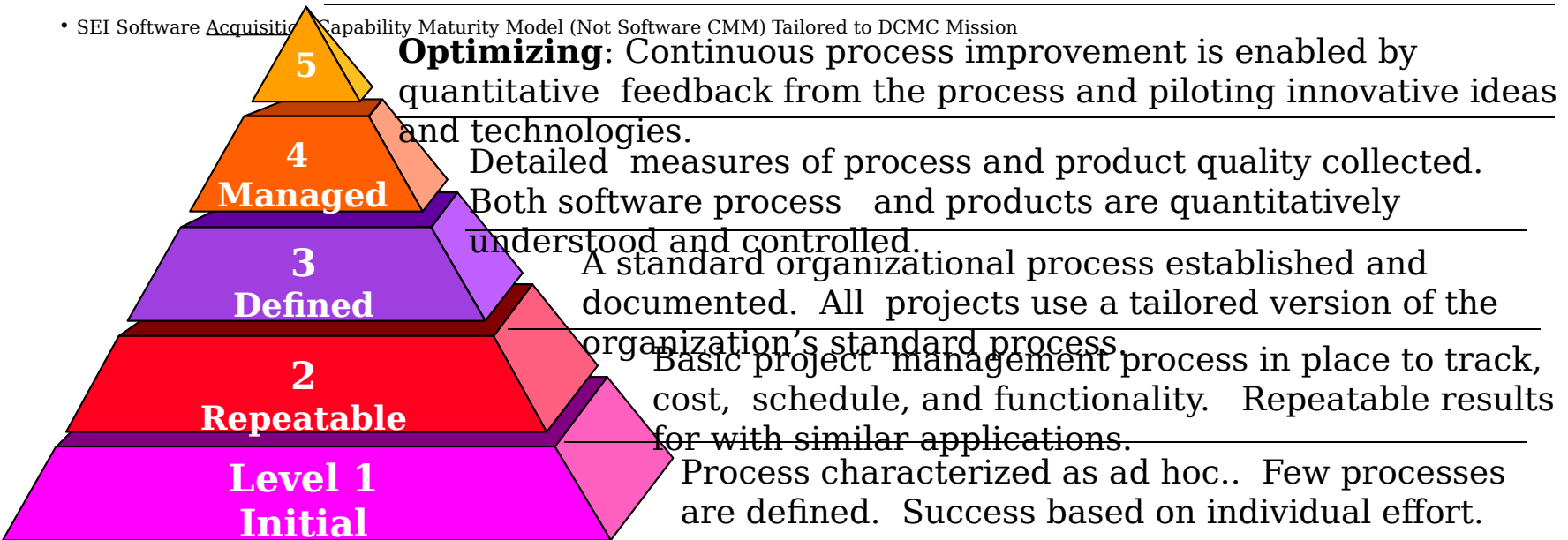
**Software Performance Maturity Model
Tasking Memo 99-255 (9 Aug 99)**

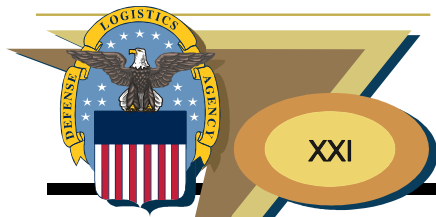


Software Performance Maturity Model

- Apply same philosophy (Process) on DCMC as used in Industry

- SEI Software Acquisition Capability Maturity Model (Not Software CMM) Tailored to DCMC Mission





Software Performance Maturity Model

- ✓ Developed Model with field team: Jan-Mar 99
- ✓ Pilot tested at DCMC CAOs: Mar - May 99
 - Sikorsky - LM Federal Systems (Owego) - Boeing, Seattle
 - Baltimore - LM Missiles & Space-Sunnyvale - Boeing, Phil
- ✓ Model updated: Jul 99
- CAO Training:
 - Software Symposium (31 Aug-2 Sep) - Concept and plan
 - Detailed CAO training (14-16 Sep, 28-30 Sep)
- CAO site visits (Oct -Mar) Feedback: Immediate
- DCMC Corporate Roadmap for improvement: Apr 99



Software Performance Maturity Model

Corporate Road Map for Improvement

- First Application of Software Acquisition CMM within DoD
- Analyze current command status
 - Level I to Level II averages 27 months
 - Level II to Level III averages 24 months
- Probably result in changes to policy, training, guidance, and the model

**SEI
historical
data for
SW CMM**

Blazing new ground but on the right path



S/W CAS activity performance at CAOs Pilot Results

Key Process Area (KPA) Satisfaction Profile

KPA RATING	
	= KPA CRITERIA MET
	= KPA CRITERIA NOT MET
LEVEL RATING	
	Performed
	Repeatable
	Defined
	Quantitative
	Optimized

CAO	SW CAS Planning	SW CAS Mgt	Sup'r Tracking & Insight	Sup'r P&P Eval	Proc Def & Maint	Sup'r Perf Mgt	DCMC Risk Mgt	Training	Quantitative SW CAS	CPI	CAO SPE LEVEL
CAO-F											
CAO-E											
CAO-D											
CAO-C											
CAO-B											
CAO-A											



Model Breakdown

Repeatable				Defined				Quantitative	Optimized
SW CAS Planning	SW CAS Mgmt	Supplier Tracking & Insight	Supplier Process & Product Evaluation	Process Definition & Maintenance	Supplier Performance Management	DCMC Risk Mgmt	Training		Continuous Process Improvem't
Co 1	Co 1	Co1	Co1	Co1	Co 1	Co 1	Co1	Co 1	Co 1
Co 2	Co 2	Co2	Co2	Co2	Ab 1	Co 2	Co2	Co2	Co 2
Ab 1	Ab 1	Ab 1	Ab 1	Co3	Ab 2	Ab 1	Ab 1	Ab 1	Co 3
Ac 1	Ab 2	Ab 2	Ab 2	Ab 1	Ac 1	Ab 2	Ab 2	Ab 2	Ab 1
Ac 2	Ab 3	Ab 3	Ab 3	Ab 2	Ac 2	Ab 3	Ab 3	Ac 1	Ab 2
Ac 3	Ab 4	Ac 1	Ac 1	Ab 3	Ac 3	Ac 1	Ac 1	Ac 2	Ac 1
Ac 4	Ac 1	Ac 2	Ac 2	Ab 4	Ac 4	Ac 2	Ac 2	Ac 3	Ac 2
Ac 5	Ac 2	Ac 3	Ac 3	Ac 1	Ac 5	Ac 3	Ac 3	Ac 4	Ac 3
Me 1	Ac 3	Ac 4	Ac 4	Ac 2	Ac 6	Ac 4	Ac 4	Ac 5	Ac 4
Ve 1	Me 1	80	Me 1	Ac 3	Me 1	Ac 5	Ac 5	Ac 6	Ac 5
Ve 2	Ve 1	Ac 6	Ve 1	Ac 4	Ve 1	Me 1	Me 1	Me 1	Ac 6
		Ac 7	Ve 2	Ac 5	Ve 2	Ve 1	Ve 1	Ve 1	Me 1
		Me 1		Ac 6		Ve 2	Ve 2	Ve 2	Me 2
		Ve 1		Me 1					Ve 1
		Ve 2		Ve 1					Ve 2
G1	G1	G1	G1	G1	G1	G1	G1	G1	G1
G2	G2	G2	G2	G2	G2	G2	G2	G2	G2
				G3	G3		G3	G3	G3
					G3				

Example Profile of DCMC CAO Results per Key Process Areas

Co = Commitment

Ab = Ability

Ac = Activity



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- 1.3: Provide insight concerning contractor evaluations

Goal 2

- 2.1
- 2.2
- 2.3

Heads Up

DCMC Software Symposium
Tasking Memo 99-233 (1 Aug 99)



SW Symposium

- Training Conference: 31 Aug - 2 Sep 99
- Agenda:
 - Commander's Perspective: Maj Gen Malishenko
 - DCMC Software CAS Integrated Plan: Ms. Pettibone
 - Customer perspective: Program Offices
 - Training sessions
 - SW Performance Maturity Model
 - Practical Software Measurement
 - Performance measurement
 - Earned Value Measurement
 - CMM Based Insight
 - DCMC Software Professional Estimating and Collection System



Wrapup

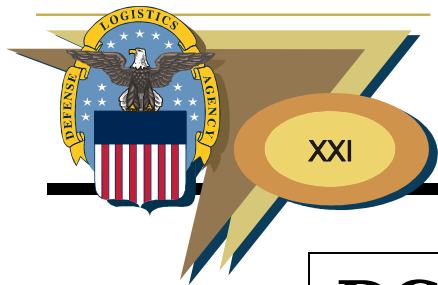
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Additional Questions/Assistance

DCMC Software Center (1-888-616-7598)

<http://www.dcmc.hq.dla.mil>

DCMC Software Center Mission

- **Leverage DCMC resources to support customer requests.**
- **Train and equip DCMC Software Professionals in “state-of-the-art” software acquisition techniques to provide program offices with visibility into project cost, schedule**

Additional Information:

April 99 DCMC Special Management Review

<http://www.dcmc.hq.dla.mil/hot/mmr/m>

End of Briefing